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On a New Deep-sea Alcyonarian from Sagami Bay,
Carotalcyon sagamianum n. gen. et n. sp.

With 1 Text-figure

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(Communicated by T. KOMAI)

Last year, while examining the vast collections of marine animals preserved in the museum of the Zoological Institute of Tokyo University by permission of Prof. K. Takewaki, I happened to find a remarkable alcyonarian, appearing aberrant both in shape and in color. This interesting specimen was obtained by Kumakichi Aoki with a long line at a depth of 170 "hiro" (=280 meters) in Sagami Bay during the late Prof. Ijima's collecting survey for Hexactinellid sponges in 1895, and since has been preserved in that museum. It is certainly surprising that such a remarkable animal has remained unnoticed for so many years.

On examination I confirmed that it represented a new and very remarkable Alcyoniid type, showing an affinity with the deep-sea dimorphic alcyonarians, *Anthomastus* and *Bathyalcyon*, both of which have been found in the same bay (Kükenthal 1910; Kinoshita 1911). As the animal resembles a carrot in its external appearance and coloration, I wish to call it *Carotalcyon sagamianum*, n. gen. et n. sp.

Carotalcyon sagamianum, n. gen. et n. sp.

Locality. Sagami Bay, 170 "hiro" (=280 m) in depth. April 2, 1895.

External appearance. The single well-preserved colony is coral-red or carrot-like in color, and measures about 7 cm in length, from the outer border of the basal disc to the top of the polyparium. It consists of a somewhat contracted capitulum bearing some robust finger-like processes and a rigid columnar sterile stalk. Thus it resembles the forms of Fasciculariidae (e. g. *Paralcyonium*, *Studeriotos* and *Fascicularia*) more than those of Alcyoniidae (e.g. *Anthomastus*, *Bathyalcyon*,

Sarcophyton, *Acrophytum*, *Metalcyonium*, etc.).

The stalk is tough in texture and has a height of 45 mm (about 35 mm along the central axis). It bears an expanded marginal ridge at the top and is somewhat depressed at its center to form the capitular disc. The base is hollowed out to give attachment to the substratum; it measures about 27 mm in the maximum diameter. The outer surface of the stalk is much wrinkled, as the result of strong contraction. No ornamentation of particular spicules, as is seen in the family Fasciculariidae, is found.

The capitular disc measures about 22×25 mm and is somewhat depressed. It carries more than a dozen finger-like processes, completely covered by polyps. The basal part of the polyparium does not protrude beyond the marginal border of the capitulum, so that the precise mode of branching can hardly be detected. The finger-like processes, when protruded, measure in length from 9 mm to 25 mm and have an average diameter of 4–7 mm at the base. Most of them are stocky, slightly branched distally, and roundly ended; also some unbranched processes may be found.

The polyps are dimorphic, as in most of the genera of Alcyoniidae, and have both kinds of zooids only on the finger-like processes and the capitular disc. The surface covered by these polyps looks very uneven and tuberoso. The autozooids are completely retractile, comparatively few in number, and about 1–2 mm apart. Between these zooids there are distinct siphonozooids, arranged at intervals of about 0.3–0.6 mm. The autozooids, when completely retracted, form very prominent papillae, 8-lobed and with a central pit. The siphonozooids appear to the naked eye as faintly colored and slightly elevated tiny spots, due to the lack of colored spicules.

When fully expanded, the autozoid is flexible and wholly white, but not transparent, so that the stomodaeum and mesenteries are not visible from outside. It measures about 1.2 mm in length, excluding the tentacles and about 0.8–0.9 mm in diameter. The very characteristic feature of the autozoid is the lack of spiculation of the polyp body and the 2-rowed pinnules in the tentacles. The tentacles are about 1 mm long and 0.3 mm wide at the base. The aboral side of the rachis is strongly convex in cross section, while the oral side is flattened and provided with 2 rows of low conical pinnules on either side of the broad median streak, as found in the Xenidiids. The pinnules number about 10 in the inner row and 12–16 in the outer row. The longest pinnule is 0.18 mm long and 0.07 mm wide in the middle. The mouth is as large as 0.5 mm, and its margin is prominently elevated above the oral disc.

Dissection shows the internal structure of zooids to a certain extent. When the polyp body is removed, the autozoid shows a spacious lumen of the stomodaeum and coelenteron. The opening is provided with 8 conical lobes covered densely with colored spicules, which are the pseudo-oral extension of the coenenchymal epithelium. The stomodaeum lying below is a relatively short tube, about 0.3 mm in length and 0.8 mm in diameter, and surrounded by a thick wall, which is considerably striated transversely by the development of musculature. Eight strong mesenteries extend downwards from the edge of the stomodaeum into the coelenteron.

The siphonozooids are uniformly distributed over the surface of the polyparium and capitular disc. No trace of tentacles or lobes is found around the mouth. The siphonozooids are connected with one another by means of a canal system, the solenia, and also with the coelenteron of the autozooids by short and wide canals. The stomodaeum is very short, measuring about 0.18 mm in diameter, and leads into the larger coelenteron, which is subdivided by the eight mesenteries as usual. Of the mesenteries only the two dorsal ones possess thickened edges or mesenterial filaments. The remaining six mesenteries are very feeble, and only one or two of them carry a single gonad in the deeper part. When ripe the gonad forms a spherical body, measuring about 0.2 mm in diameter. In this respect this alcyonarian shows a closer resemblance to *Bathyalcyon* than to any other form. But the number of mesenteries in the siphonozooids is always eight as in *Anthomastus* and other dimorphic alcyonarians, instead of being only six as in *Bathyalcyon* (cf. Kükenthal 1906, Cylkowski 1911, Molander 1915 and Bock 1938).

Spiculation. As mentioned above, the extensible autozooids are entirely devoid of spicules. Characteristic spicules occur only in the coenenchyme, and are far more numerous in the periphery, where they are densely crowded, than in the deeper parts of the stalk. All the spicules are very minute, as compared with those in other ordinary Alcyoniids, and caroty or coral-red in color. The characteristic color of the colony is solely due to the spicules. The spicules may be classified into the following three types according to their shape and location.

In the canal-walls of the polyp-bearing processes, only thorny rods (Fig. 1, *k*) occur sparsely; they measure: 0.046×0.012 mm, 0.056×0.018 mm, 0.06×0.018 mm. In the cortex of these processes, dump-bell spicules of the double-stars type (Fig. 1, *h-j*) are densely distributed; they measure: 0.05×0.028 mm, 0.06×0.036 mm. In the barren stalk, the periphery is very thick, reaching up to about 3 mm in thickness,

compact in texture and densely filled with spicules of the double-crosses type (Fig. 1, *f-g*), of which the regularly shooting prominences, typically 8 in number, are always headed like a rivet with 6-8 pointed

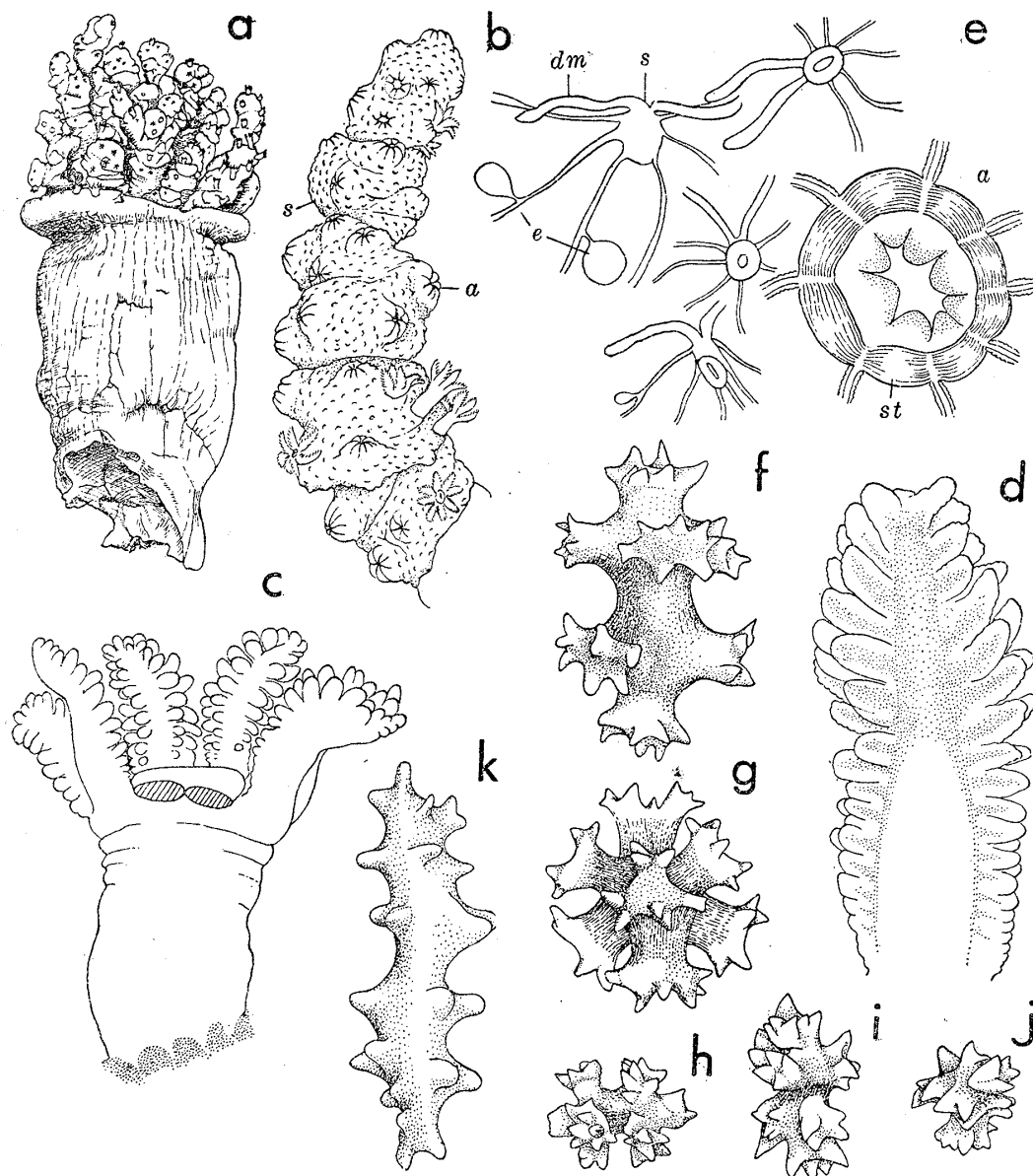


Fig. 1. *Carotaleyon sagamianum*, n. gen. et n. sp.

a, holotype, slightly reduced; *b*, a polyp-bearing finger-like process $\times 3$; *c*, fully expanded autozoid, two tentacles in front being omitted $\times 27$; *d*, tentacle of autozoid with 2 rows of pinnules, viewed from oral side $\times 50$; *e*, inner view of the arrangement of two zooids, slightly schematized after a camera drawing $\times 20$; *f*, dumb-bell spicule from sterile stalk, viewed from side $\times 330$; *g*, the same, viewed from above $\times 330$; *h*, *i*, dumb-bell spicule from periphery of polyparium, viewed from side $\times 330$; *j*, the same, viewed from above $\times 330$; *k*, rod-like spicule from canal-walls of polyparium, viewed from side $\times 330$.

[*a* autozoid, *dm* dorsal mesentery of siphonozoid, *e* ova, *s* siphonozoid, *st* stomodaeum of autozoid.]

warts around the edge. They are a little larger than the above double-stars, being usually about 0.07×0.06 mm, 0.09×0.06 mm. They occur also in the deeper parts of the stalk, though not so densely as in the periphery.

SYSTEMATIC POSITION

Alcyoniidae include some aberrant forms recorded from various localities, such as *Anthomastus*, *Bathyalcyon*, *Acrophytum*, *Malacacanthus*, *Daniela* and *Cereopsis*. These genera are all monotypic, with the exceptions of *Anthomastus* and *Cereopsis*. The first three genera have dimorphic polyps, while the remaining three have monomorphic polyps.

The present alcyonarian seems to be most closely related to *Anthomastus* on account of the polyp dimorphism and spiculation. On the other hand, this somewhat resembles the genera of Fasciculariidae, especially *Paralcyonium elegans* M.-Edw., which family is characterized by the whole polyparium being withdrawn into the sterile stalk. In the present form, however, the polyparium is partially retracted within the sterile stalk, and the exact mode of branching is difficult to examine. Judging from the rigidity and compactness of the stalk, it seems very doubtful whether the polyparium can be wholly withdrawn as in all the forms of Fasciculariidae (cf. Motz-Kossowska & Fage 1907, Kükenthal 1924, Thomson 1929, Hickson 1930, Thomson & Dean 1931 and Stiasny 1941).

For the same reason it seems unlikely that the coelenteron of the autozooids extends even to the base of the colony. I did not dare to dissect the stalk to ascertain the state of coelenteron as the specimen is unique and too valuable. In any case, the closest relationship of the present alcyonarian to the genera *Anthomastus* and *Bathyalcyon* can hardly be denied. At the same time the present alcyonarian has some characteristics which are generically distinct from both the allied genera. These three genera may be included together in a specialized group amongst the family Alcyoniidae (corresponding to Anthomastinae of Bock). The diagnosis of the new genus *Carotalcyon* may be given as follows:

Carotalcyon, n. gen.

Columnar Alcyoniid colonies consisting of a capitular disc bearing finger-like processes provided with polyps, and a sterile stalk. Polyp dimorphism exists. Autozooids rather few, large, and retractile. Siphonozooids numerous, and with gonads. Spicules confined to coenenchyma and not found in polyps. Spicules of polyparium are double-stars in cortex and thorny rods in canal-walls. All stalk spicules are double-crosses.

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